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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/593,848	08/06/2007	Chang-Hee Lee	5489.P092	4444

8791 7590 06/08/2011

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EXAMINER	
JACOB, OOMMEN	
ART UNIT	PAPER NUMBER
2613	

MAIL DATE	DELIVERY MODE
06/08/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/593,848	LEE ET AL.	
	Examiner	Art Unit	
	OOMMEN JACOB	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 October 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to Claims 1-22 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 4-5, 11-14, 17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ball [US PAT NO: 7016608] in view of Kani [US PUB NO: 2004/0264963].

As per Claims 1, 17 and 20

Ball teaches a wavelength division multiplexing passive optical network (WDM- PON) for performing bi-directional communication (*Ball Fig 2 shows WDM network. Col 10 line 45-56 and Fig 27 discloses bidirectional communication*), the WDM-PON comprising:

two or more remote distribution nodes in between a central office and a first optical network unit including a first remote distribution node and a second remote distribution node (*Ball Fig 2 item 2 is first remote distribution node, and items 5 and 7 comprise the second*

remote distribution node), each of the first remote distribution node and the second remote distribution node is located in a physically separate location (*Ball Fig 2 nodes are in physically separate locations*), wherein the first remote distribution node has at least one band splitting filter configured to couple a first composite optical signal, wherein the first composite signal travels on the first optical cable in a first direction (*Ball Fig 2 item 4 is an AWG configured to couple and band split a first composite optical signal from CO. The AWG is functionally equivalent to the claimed band splitting filter*), and configured to connect to the second remote distribution node coupled to two or more optical network units (*Ball Fig 2 item 2 is connected to items 5 and 7 . these items are further connected to two or more ONUs*), wherein each of the first remote distribution node and the second remote distribution node separates one or more wavelength channels from the first composite optical signal distributed through that remote distribution node (*Ball Fig 2 discloses band splitting into wavelengths at 4,5 and 7*).

The only difference between the Claim and Ball is that, Ball Col 10 line 45-56 and Fig 27 merely mentions that bidirectional communication may be established but does not explicitly teach that the AWG 4 is capable of coupling a second composite optical signal to the first optical cable connected to the central office and the second composite optical signal travels on the first optical cable in a second direction opposite the first direction, as required by the Claim. That is ball does not expressly teach that the AWG 4 is capable of bidirectional communication. However this property of AWG is well known in the art. For example Kani ¶0009 discloses that an arrayed waveguide is functionally capable of simultaneous multiplexing and demultiplexing, due to FSR characteristics. Bidirectional communication is established as shown in Fig 1 of Kani. At the time of invention it would have been obvious to a person of ordinary skill in the art

to make use of this known functionality of an AWG, in the remote node of Ball Fig 2. The motivation would be to implement simultaneous bidirectional communication between OLT and ONUs.

As per Claim 4

Ball in view of Kani teaches Claim 1 as discussed above.

Ball in view of Kani further teaches wherein the second remote distribution node containing contains a first multiplexer/demultiplexer to receive a first subset of the wavelength channels in the first composite optical signal from the first remote distribution node (*Ball Fig 2 discloses that a first demultiplexer inside item 5, receives $\lambda m1$- λmn*) and to send a first portion of wavelength channels in the second composite optical signal to the first remote distribution node wherein the second composite optical signal occupies a different wavelength band than the first composite optical signal (*Ball Col 10 lines 45-50 discloses that upstream traffic is possible if different wavelengths are used*).

As per Claim 5

Ball in view of Kani teaches Claim 5 as discussed above.

Ball in view of Kani further teaches wherein the second remote distribution node also contains a second multiplexer/demultiplexer to receive a second subset of the wavelength channels in the first composite optical signal from the first remote distribution node (*Ball Fig 2 discloses that a second demultiplexer item 7, receives $\lambda 11$- $\lambda 1n$*) and to send a second subset of wavelength channels from the second wavelength band to the first remote distribution node (*Ball Col 10 lines 45-50 discloses that upstream traffic is possible if different wavelengths are used*).

As per Claims 11-12

Ball in view of Kani teaches Claim 1 as discussed above.

Ball in view of Kani does not expressly teach wherein the first remote distribution node has a multiplexer/demultiplexer coupled to two or more band splitting filters configured to split the first composite optical signal that includes all of the wavelength channels in a first wavelength band into a first subset of wavelength channels and a second subset of wavelength channels, wherein the second remote distribution node containing contains a first multiplexer/demultiplexer to receive the first subset of wavelength channels from the first remote distribution node, a second multiplexer/demultiplexer to receive the second subset of wavelength channels from the first remote distribution node.

However, from Ball in view of Kani, the method of splitting/combining wavelengths are known. Here only a two stage process is shown. However, a person of ordinary skill would not have required undue experimentation to add additional multiplexer/demultiplexer along the communication path (including in each of the nodes) to split/combine signals, depending on number of splits and number of wavelengths in each spilt. This would provide a multistage mux/ demux system. These are determined by networks needs, and such splitting can be achieved by changing grating properties of AWG and number of AWGs.

As per Claim 13

Ball in view of Kani teaches Claim 12 as discussed above.

Ball in view of Kani further teaches wherein the second remote distribution node to send a first through fourth portions of the wavelength channels in a second wavelength band to the second multiplexer/demultiplexer in the first remote distribution node via the band splitting filters, wherein the second multiplexer/demultiplexer to combine the wavelength channels from

the first through the fourth portions (*Ball Fig 2 shows 1-n wavelengths transmitted to ONU. N may be equal to 4. Further Col 10 discloses that bidirectional communication may be established in the reverse direction. Hence 1-4 wavelengths may be combined/split at item 7*).

As per Claim 14

Ball in view of Kani teaches Claim 11 as discussed above.

Ball in view of Kani further teaches wherein the at least one band splitting filter is further configured to separate the first composite optical signal and the second composite optical signal (*Kani ¶0009 discloses that an arrayed waveguide is functionally capable of for simultaneous multiplexing and demultiplexing, due to FSR characteristics. This means that upstream and downstream traffic are separated by single AWG*).

3. Claims 2-3 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ball in view of Kani as applied to Claim 1 above and further in view of Liu [US PUB NO: 2001/0038479].

As per Claim 2

Ball in view of Kani teaches Claim 1 as discussed above.

Ball in view of Kani does not expressly teach wherein the first remote distribution node having has a series of band splitting filters configured to split the first composite optical signal that includes all of the wavelength channels in a first wavelength band into a first subset of the wavelength channels and a second subset of the wavelength channels. Instead they teach an AWG.

Liu teaches band splitting using a series of band splitting filters (*Liu Fig 1 discloses two stages of band splitting filters based. More stages can be added based on groups and channel assignment for groups*). This configuration is capable of splitting signals as claimed.

Ball in view of Kani discloses the claimed invention except that they use an AWG instead of a series of band splitting filters. Liu shows a series of band splitting filters for separating and combining (mux/demux) wavelengths is an equivalent structure known in the art. Therefore, because these two multiplexing/demultiplexing were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute the AWG with the series of band passing filters.

As per Claim 3

Ball in view of Kani teaches Claim 1 as discussed above.

Ball in view of Kani and Liu further teaches wherein the series of band splitting filters are also coupled together to create a second composite optical signal in a second wavelength band by combining a first portion of the wavelength channels in the second wavelength band and a second portion of the wavelength channels in the second wavelength band, wherein the second composite optical signal travels in the opposite direction of the first composite optical signal (*Liu teaches that the series of filters can be used for multiplexing/combining wavelengths. Liu Fig 7 multiplexing is form left to right direction*)

As per Claim 15

Ball in view of Kani teaches Claim 1 as discussed above.

Ball in view of Kani further teaches the first remote distribution node includes a first multiplexer/demultiplexer (*Ball Fig 2 item 4*) and the first multiplexer/demultiplexer distributes

two or more of the wavelength channels in the composite optical signal (*Ball Fig 2 discloses distribution of wavelengths*).

Ball in view of Kani does not teach that the first remote distribution node includes an add drop module, wherein a first drop module removes a wavelength channel from a composite optical signal that includes all of the wavelength channels.

Liu teaches an add drop module, wherein a first drop module removes a wavelength channel from a composite optical signal that includes all of the wavelength channel (*Liu Fig 5 discloses add drop port for selectively removing wavelength channels*).

At the time of invention it would have been obvious to a person of ordinary skill in the art to integrate a programmable add/drop module as disclosed Liu, between the Hub and the first distribution units in Ball in view of Kani, so as to provide a method of adding/dropping channels/customers in a network, without interrupting or affecting other channels involved in the network.

As per Claim 16

Ball in view of Kani teaches Claim 1 as discussed above.

Ball in view of Kani further teaches the first remote distribution node containing a first multiplexer/demultiplexer (*Ball Fig 2 item 4*).

Ball in view of Kani does not expressly teach two or more add/drop modules coupled to an optical fiber from the central office to the first remote distribution node, wherein the add/drop modules to remove wavelength channels from a downstream optical signal prior to the first multiplexer/demultiplexer.

Liu teaches add/drop modules that can be used in combination with WDM for adding and dropping channels (*Liu Fig 5*).

At the time of invention it would have been obvious to a person of ordinary skill in the art to integrate a programmable add/drop module as disclosed Liu, between the CO and distribution nodes, so as to provide a method of adding/dropping channels/customers in a network, without interrupting or affecting other channels involved in the network.

4. Claims 6-10, 18-19 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ball in view of Kani as applied to Claims 1, 17 and 20 above, and further in view of Tervonen [WO 03/055111]

As per Claim 8

Ball in view of Kani teaches Claim 1 as discussed above.

Ball in view of Kani does not expressly teach wherein the first direction is a downstream direction from the central office, and the second direction is upstream direction to the central office, and wherein the first remote distribution node includes an optical interleaver to receiving receive the first composite optical signal that travels in the downstream direction from the central office, divides the downstream first composite optical signal into odd wavelength channel signals and even wavelength channel signals in order to output the odd and even wavelength signals to corresponding multiplexer/demultiplexers, and receives the odd and even wavelength channel signals from the corresponding multiplexer/demultiplexers in order to combine the odd wavelength channel signals with the even wavelength channel signals.

Tervonen in teaches wherein a first remote distribution node includes an optical interleaver to receiving a downstream optical signal from the central office (*Tervonen Fig 5 item 512*), divides the downstream signal into odd wavelength channel signals and even wavelength channel signals in order to output the odd and even wavelength signals to corresponding multiplexer/demultiplexers (*Tervonen Fig 5 item 512 transmits odd channels to 511 and even to 513*), and receives the odd and even wavelength channel signals from the corresponding multiplexer/demultiplexers in order to combine the odd wavelength channel signals with the even wavelength channel signals (*Tervonen Fig 5 item 512 receives and combines odd channels and even channels from 513 and 511 respectively*).

Ball in view of Kani discloses the claimed invention except that they use an AWG instead of interleaver. Tervonen shows that an interleaver for separating and combining (mux/demux) wavelengths is an equivalent structure known in the art. Therefore, because these two multiplexing/demultiplexing were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute the AWG with the interleaver.

As per Claims 6-7, 18-19 and 21-22

Claims 6-7, 18-19 and 21-22 have limitations similar to Claim 8 and are rejected for same reasons as cited above.

As per Claim 9

Ball in view of Kani and Tervonen teaches Claim 6 as discussed above.

Ball in view of Kani and Tervonen further teaches a second remote distribution node containing a first multiplexer/demultiplexer to receive the odd numbered wavelength channels

from the first remote distribution node (*Tervonen Fig 5 item 511 receives odd numbered wavelengths from item 521*) and to send the first portion of the wavelength channels in a second wavelength band to the first remote distribution node (*Tervonen Fig 5 item 511 sends wavelengths λ2 and λ4 to the first distribution node. This is the first portion of channels in a second wavelength band λ1- λ4*).

As per Claim 10

Ball in view of Kani and Tervonen teaches Claim 9 as discussed above.

Ball in view of Kani and Tervonen further teaches wherein the second remote distribution node also containing a second multiplexer/demultiplexer to receive the even numbered wavelength channels of the first wavelength band from the first remote distribution node (*Tervonen Fig 5 item 511 receives odd numbered wavelengths from item 521*) and to send a portion of the second wavelength band to the first remote distribution node (*Tervonen Fig 5 item 513 sends wavelengths λ1 and λ3 to the first distribution node. This is the second portion of channels in a second wavelength band λ1- λ4*).

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to OOMMEN JACOB whose telephone number is (571)270-5166. The examiner can normally be reached on Monday -Friday, 8:00 a.m. - 5:00 p.m., EST. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, KENNETH VANDERPUYE can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/OJ/

/Shi K. Li/
Primary Examiner, Art Unit 2613